MANUFACTURE OF ULTRAMARINE.

The blue pigment known as ultramarine, was formerly the product of a mineral, which, on account of its beauty, was also employed as a gem in jewelry. Being obtained in a few countries only, as an agent of painting it was very costly; but now—thanks to the great improvements made in synthetical chemistry—it is produced artificially at quite a moderate price. It is chiefly manufactured in the chemical establishments of Germany; and the composition and processes involved are described as follows, in *Dinglers Journal*:—

"The composition for a dark aluminous ultramarine consists of 100 parts of slightly burned kaolin (porcelain clay), 90 parts of soda-ash (95 p. c.), 100 parts of refined roll sulphur, 6 parts of rosin, and 4 of dry pine charcoal. Each of these ingredients is powdered, with the exception of the rosin, which is only added in pieces the size of a walnut when the materials have been mixed, and the whole is rolled together for the space of four hours. It then forms a smooth gray powder, and is loosely packed into fire-proof boxes, which are covered up, properly luted, and placed on the lower floor; and after closing up all the apertures of the furnace, it is rapidly brought to a point of temperature equivalent to the fusing point of an alloy of equal parts of gold and silver, at which temperature the oven is kept for from five to six hours. By means of small tubes inserted in the front of the furnaces, the process is watched: samples being taken from time to time, by means of hollow cylinder screws. When these samples remain of a green color on cooling, the fire is gradually slackened, and afterwards the draught is shut off; the furnace being left to cool for 28 hours. Two days afterwards the mass is removed from the boxes. It is first broken up under mill-stones, then finely powdered, filled into cast iron annealing boxes ($1\frac{1}{2}$ feet high, 2 feet long, and $1\frac{4}{6}$ feet wide on top, somewhat narrower in the bottom, the iron $\frac{1}{5}$ of an inch thick), the covers of which overlap the sides. These boxes are placed on the upper floor of the furnace, at the same time that a fresh charge is placed on the lower floor; and are removed about twelve hours after the firing has ceased. This annealing or coloring, which changes the green to blue, by partly oxidising, and partly removing an excess of sulphur, is similar to the process of coloring red-lead.

"The blue pigment now obtained is lixiviated, and then, while moist, ground between granite or quartz millstones. When the desired fineness is obtained, the pulp is run into draining bags, and afterwards put in cast-iron dishes. which are also placed in the upper floor of the furnaces to dry, whenever the iron annealing boxes have been removed. On the Rhine, some factories are supplied with reverberatory furnaces, the soles of which are heated from below by the fire, which then again passes over the charge before reaching the flue. Such furnaces hold as much of the crude materials as will yield about 1,300 pounds of ultramarine.

"Another method consists in mixing the materials in smaller quantities, and forming them into batches, in boxes containing only about 700 pounds each. These boxes are placed in pairs on the benches of a double floor reverberatory furnace, constructed after the manner of a smalt furnace, heated by one fire, which first passes around the boxes on the lower floor, and from underneath them to the upper floor. The masonry of the lower floor is fire-brick, the supports of both soles and arches being stone, and the upper floor is formed of iron plates. The boxes are made from fire-proof tiles, one inch thick, grooved and let in at the edges. The fuel used is bituminous coal."

A Testimonial.

MESSRS. MUNN & Co.--I received my patent papers from Washington yesterday, and am much pleased with them, they being very accurately prepared. The drawings are superbly executed. I had rather give you five times your price, than have them prepared by inexperienced persons—as a thing worth doing is worth doing well. I shall cheerfully recommend you, as honorable and reliable patent attorneys, and worthy the confidence of inventors who wish their rights protected.

ALEX M. BRISTOL.

Detroit, Mich., July 14, 1863.

Scientific Paradoxes.

The water which drowns us—a fluent stream—can be walked upon as ice. The bullet which, fired from a musket, carries death, will be harmless if ground to dust before being fired. The crystallized part of the oil of roses—so graceful in its fragrance—a solid at ordinary temperatures, though readily volatile—is a compound substance, containing exactly the same elements, and in exactly the same proportions, as the gas with which we light our streets. The tea which we daily drink, with benefitand pleasure, produces palpitations, nervous tremblings, and even paralysis, if taken in excess; yet the peculiar organic agent called theine, to which tea owes its qualities, may be taken by itself (as theine, not as tea) without any appreciable effect. The water which will allay our burning thirst, augments it, when congealed into snow; so that Capt. Ross declares the natives of the Arctic regions "prefer enduring the utmost extremity of thirst, rather than attempt to remove it by eating snow." Yet if the snow be melted, it becomes drinkable water. Nevertheless, although, if melted before entering the mouth it assuages thirst like other water, when melted in the mouth it has the opposite effect. To render this paradox more striking, we have only to remember that ice, which melts more slowly in the mouth, is very efficient in allaying thirst.

Sights and Sounds of War.

The City Hall Park opposite our office presents a vivid picture of the actualities of war. Since the riots occurred, it has been tenanted by batteries of artillery, and companies of cavalry and infantry. These latter drill regularly in the morning, and the "spirit-stirring drum, and ear-piercing fife" are sufficiently audible. Tired artillerymen lay stretched upon the ground beside their guns; gaunt cavalry horses—some of them far outvieing Don Quixote's Rosinante in point of leanness—look wistfully toward trusses of hay that lay beyond their reach. The guard paces monotonously up and down; those that are off duty lounge and smoke; and a motley group of idlers, apple-women, and citizens in general, surround the encampment, gazing with curious eyes upon this scene, so novel in the heart of the great metropolis. Even as we write, the air is full of martial sounds proceeding from the camp; and squads of men are moving to and fro, intent on duty. The peaceably-disposed portion of the community do not object to the occupancy of the Park for this purpose; but others of opposite inclinations are loud and voluble in their indignation.

Shocking Accident.

A terrible accident occurred on the 21st inst., by which a number of persons, mainly children, lost their lives. A part of the wall of the Police Station in the 18th ward, which had been burned by the rioters, was left standing in a dangerous condition; and at the time of the accident, a large number of women and children were in the ruins, busily searching for coal which was said to be buried there. A high wind prevailed, and those beneath the dangerous portion of the building were warned to fly while they had time. Several did so, but others remaining were crushed by the bricks which fell with terrific force. A large number, estimated at twenty children, and grown people, were buried; and up to this time only eleven bodies have been exhumed.. It is thought that others will be found as the investigation proceeds. The spectacle is said to have been shocking, at the time the wall fell in; and many women fainted who witnessed it.

Californian Woolen Goods.

About two years ago the California Pioneer Woolen Factory, situated near Black Point, was totally destroyed by fire. The losses were very great, but the company re erected the building, provided it with more expensive and serviceable machinery than before, and now turn out handsome and durable goods The new building is of brick, 242 by 50 feet. There are four artesian wells, which with other means, supply abundance of water. An 80 horse power engine, from Donahue's Foundry, consuming three and a half tuns of Mount Diablo coal per diem, moves the machinery. About fifty-five hands are employed, a few of whom are females, and a number of them Chinamen. About 500,000 pounds of wool are used yearly. The products are coatings, cassimeres, flannels and blankets. The finest quality of blankets made command $14 per pair, and the cheapest $8 per pair.

MISCELLANEOUS SUMMARY.

AMERICAN ART IN ENGLAND.—The London *Times* says: "The reputation of Mr. Church, the most eminent American landscape painter, has been brought to this country by his 'Niagara,' and 'Heart of the Andes.' His pictures of 'Icebergs off the Coast of Labrador,' now exhibited at the German Gallery, will enhance the estimation of Mr. Church with those who have seen his former pictures, and affords an excellent opportunity for those who have not, to form a conception of what landscape painting in the United States is aiming at and achieving. . . The picture altogether is a noble example of the application of the landscape painter's art to the rendering of grand, beautiful, and unfamiliar aspects of nature, only accessible at great cost of fatigue and exposure, and even at peril of life and limb; which seems to be one of the walks in which this branch of the art is destined to achieve new triumphs in our time. All who can honor and appreciate the art, in this new and arduous development of it, should see Mr. Church's great picture."

THE Michigan Southern Railway Company have ordered six new 30 tun locomotives to be made with all dispatch, also a large number of freight cars, as both their motive power and rolling stock are inadequate to the demands upon them. A late number of the Toledo *Commercial* reports about 200 cars of the Michigan Southern Railroad standing on the track at the depot, filled with grain, goods, &c., which could not be unloaded, because of no store rooms, and there being no propellers in port to transport their freight away.

COTTON SUPPLY.—At a late meeting of the cotton supply association, held in Manchester, the chairman stated that 1,072,000 bales were received from India in 1862; and that 1,200,000 bales were expected this year from the same source; which with 600,000 bales from other countries, would be about sufficient to give only three days work per week to the English cotton operatives. The machinery in several factories has been altered to work surat cotton; but American cotton is so superior, that three pounds of it can be spun in the same time as one pound of surat.

THE great bridge over the Susquehanna river, at Columbia, Penn., which was destroyed by fire on the 28th ult., was constructed in 1834, and cost $157,000. It was 5,020 feet long, 14 feet above high water, built all of wood, and about 40 feet wide; comprised 28 spans, resting upon stone abutments; was covered; roof above roadway, 25 feet; had two tracks also, used for vehicles and foot passengers, and tow paths, the latter for the Susquehanna and Tidewater Canal.

PACIFIC HARVESTING MACHINERY.—The California *Farmer* says:—The sale of harvesting machinery has never been so great as in the present year. The number of implements that have been sold by the several dealers is beyond any precedent. At San Francisco, they refer with just pride to the several agricultural warehouses in the city, where the assortment of agricultural implements is equal to that found in any part of the world.

MESSRS. J. Z. & C. Goodrich, at Glendale, Mass., are now running their woolen mill, on satinets and melton cloths. They have 60 looms, which, until recently, ran night and day for six months, on a large contract for A. T. Stewart & Co., of this city. There are 7 sets of cards in the mill, and from 10,000 to 12,000 yards of goods are produced in a week. At present there is a great scarcity of help.

THE long submarine line of telegraph between Malta and Alexandria has not been working for several weeks. The cable is supposed to have been broken by the anchor of some vessel.

THE manufacture of Armstrong guns is now entirely suspended at the Royal Arsenal, England

THE original MSS. of Gray's "Elegy" was recently sold in England for $500.

THE EXPANSIVE WORKING OF STEAM.

The ultimate quantity of mechanical power which theory assigns to steam is so great, that there is something tantalizing in comparing therewith the dynamical results attained by even our very best engines. Theory, of course, prescribes an infinite pressure, and an infinite degree of expansion. As a practical approach to such a pressure, we have the legend of Alban, the German doctor, who sent his steam upon the piston at 1,000 pounds per square inch. This was done, too, here in London; and although the performance was for no great space of time, it is not recorded that any one was blown up. Now, to obtain the greatest effect, theoretically at least, from steam, of whatever pressure, it is necessary to work it in a condensing engine, and to condense down to a perfect vacuum. Let us suppose, then, that steam of a total pressure of 1,000 pounds per square inch, as measured from a vacuum, is expanded to a final pressure of one-tenth of a pound only per square inch, as measured above the same *datum*. Here the expansion is ten thousand fold; and if the temperature of the steam be maintained during expansion by superheating or steam jacketting, the effect or power obtained will be 10.21 times greater than if the same weight of steam were worked without expansion. Thus, if an engine work, without expansion, with 5 pounds of coal per hourly indicated horse power, the rate of expansion just considered should result in a consumption of 49 pounds of coal only for the same effect, this quantity being exclusive, however, of that required to maintain the heat of the steam during expansion But, if we could impart even three-fourths of the full heating value of good coal to the water in steam boilers, we should, upon the same theoretical consideration, attain to a still greater degree of economy. Thus a pound of good coal gives off in combustion as much heat as would raise 16,000 pounds of water through a temperature of 1°, or more than enough to raise 13 pounds of water of ordinary temperature into very high-pressure steam. If, then, we attained an ordinary rate of evaporation of 10 pounds of water per pound of coal, we should be working with say 3 pounds of coal per hourly indicated horse-power, with condensation and without expansion; and, with the allowance already mentioned for maintaining the temperature of the steam during expansion, with hardly more than a ¼ pound per horse-power, with an expansion of ten thousand fold. This would be a tolerably close approach to the theoretical economy of heat as referred to Joule's equivalent. For if we obtain from a pound of coal, say 12,000 "units of heat," or, in other words, as much heat as would suffice to raise 12,000 pounds of water through 1°, or 10 pounds of water through 1,200°, then the mechanical power represented by each unit of heat being 772 foot-pounds, the corresponding total power represented by a pound of coal (even when but three-fourths of its total heating power is calculated upon) is 9,264,000 foot-pounds, equal to $\frac{9264000}{1980000}$=4 67 hourly horse-power, corresponding to 0.214 pounds of coal nly per indicated horse-power per hour.

Ever one conversant with the theory of steam must have made calculations of the nature just illustrated; and it is possible that, in some instances, the whole theory has been denied because of the apparent impracticability of attaining anything approaching such results in practice. Watt understood the advantage of condensation, and the general theory of expansion; but with steam of very low pressure, his engines required from 7 pounds to 10 pounds of coal per actual hourly horse-power; a result attributable, in a great measure, no doubt, to imperfect workmanship. Now, however, marine engines worked with steam of less than 25 pounds pressure, are going by the month together, with only 2 pounds per horse-power; and it is therefore reasonable still to look for a gradual improvement even upon this economical rate of consumption. In the manufacturing districts, and indeed, generally, upon land, extreme economy of fuel is not of such great consequence; but for steam vessels it is everything. In many parts of the world coal costs £3 and upwards a tun, but even this does not stand so much in the way of economical steaming, as the very weight of the coal required to be carried, and of the boilers and engines themselves; the total weight of coal and machinery being so great as to preclude the profitable conveyance of cargoes on long voyages. The largest transatlantic steamships (not referring to the *Great Eastern*) leave port with 1,400 tuns of coal on board, while the weight of their engines and boilers, in working trim, is nearly as much more. If half the weight and cost of the coal could be saved, and space and displacement corresponding to 1,000 tuns could be liberated for the conveyance of merchandise, how different would be the result commercially. Such a saving is likely, however, to be soon generally effected, for the mechanical and commercial practicability of driving a 3,000-tun ship, at a mean speed of 13 knots, with, at most, 60 tuns of coal in 24 hours, has been virtually established, by the practice of the Peninsular and Oriental Company. The machinery by which this is effected is, however, costly and very heavy, although the increased weight of the engines is in a great measure offset by the diminished number and weight of the boilers; while a great saving of bulk and displacement in coal-bunkers remains as net gain, irrespective of the money saving in the diminished consumption of coal itself.

As far, then, as economy of fuel is concerned, very good results are already obtained with steam of from 20 pounds to 25 pounds, moderately superheated, and with surface condensation; but a further advantage remains to be obtained from steam, by higher pressure and an increased speed of piston. A good high-pressure marine boiler would, it might be supposed, be now forthcoming, since the extensive introduction of surface condensers supplying distilled water.

While dealing with expansive working, it will not be inappropriate to say a few words as to indicator diagrams from expansive engines. It is easy to set out a theoretical expansion curve for any point at which the steam is cut off, allowing also for the loss of pressure due to expansion. For those who do not care to calculate the ordinates, or refer to hyperbolic logarithms, there is (if not out of print), a very convenient diagram by Mr. Charles Cowper, published by Weale, from which any one may lay down a theoretical expansion diagram. This diagram was published as long ago as 1849, and yet it carefully allows for the loss of pressure during expansion; a loss which, indeed was pointed out by Oliver Evans, as early as 1805 But no theoretical expansion diagram will agree with that obtained in practice frem the indicator, when cutting off at the same point in the stroke; nor will the indicator diagram, in many cases, afford an accurate representation of the work really obtained from the steam used. For in the case of unprotected cylinders, with a long stroke and a slow speed of piston, the internal cooling is sometimes so great that as much steam is condensed on entering the cylinder as appears on the diagram. Between two and three years ago, a "board" of American naval engineers made a series of experiments to ascertain whether there was any gain (!) in expansion; and they confined their observations to a condensing engine, having an unjacketted cylinder with an 8 feet stroke, the piston in some of the experiments making but eleven double strokes, or 176 lineal feet per minute. In cutting off at about one-third stroke, it was found that as much coal was burnt per horse-power as when following full stroke, and it was eventually decided, we believe, that there was no gain in expansion! Fortunately, however, the water fed to the boiler was measured; and by referring to the relative volume of the steam thus generated at the working pressure, it was found that about 40 cubic feet of steam was admitted at each stroke, into a space which, but for internal condensation, could have received but 20 cubic feet. The fact was that after the steam was cut off, the interior of the cylinder was so long exposed to a falling temperature—sinking at last to 100° when the communication was open to the condenser—that the inner surfaces of the bore lost a great deal of heat, and on the admission of steam of 250° and upwards on the return stroke, a great deal was condensed. If moisture once forms upon a metallic surface, the abstraction of heat from that surface in vaporising such moisture, is very rapid; but if the steam were kept dry, and the cylinder were heated to above its normal temperature, the mere internal radiation of heat into such dry steam, even at the temperature of condensation, would have been very slight indeed. A slight return for the heat actually taken from the cylinder at each stroke was, of course, made in the re-evaporation of precipitated moisture; but as most of this re-evaporation must have taken place while the cylinder was open to the condenser, the return was indeed slight. In many cases such re-evaporation is the source of an additional loss, by occasioning back pressure.

Priming, it is almost needless to say, will greatly affect the shape of a diagram. For water coming over with steam, and having a heat of, say 300°, quickly evaporates when the pressure by which it is surrounded has fallen to a point corresponding to 200° or less.

The leakage of valves also affects the shape of indicator diagrams, the extent of this influence being necessarily beyond any means of precise estimation. It is practically impossible to fit two flat surfaces of cast-iron so accurately together that, without ports or openings in either, they will move less easily with steam of great pressure upon them than in the open air.

In dealing with expansion also, it is very commonly assumed that, if the steam be cut off when the piston has made say one-fourth of its stroke, the expansion is necessarily four-fold. It sometimes happens, however, that the space in the steam ports and clearances at the end of the stroke is nearly equal to that included in the portion of the stroke of the piston for which dense steam is admitted. Thus, with an admission for one-sixth of the stroke, if the clearances, ports, &c., contained an amount of steam equal also to one-sixth of the stroke, one half of the effect of the steam, as measured before expansion commences, is lost, and the expansive effort is that only due to an admission for two-sevenths of the stroke: or only a little more than one-third, were there no other losses.

In these, and in other ways, the practical result of expansion differs considerably from that assigned by theory alone, and supposing no special circumstances to be taken into account.—*The Engineer* (*London*).

Great International Wheat Show.

A great International Wheat Show will be held at Rochester, N. Y., September 8th, 9th, and 10th, under the auspices of the Monroe County Agricultural Society. The following premiums are offered:—

For the best 20 bushels of white winter wheat..	$150 00
For the second best 30 bushels of white winter wheat.....	75 00
For the best 20 bushels red winter wheat.....	100 00
For the second best 20 bushels red winter wheat	50 00
For the best 2 bushels white winter wheat.....	50 00
For the second best 2 bushels white winter wheat	25 00
For the best 3 bushels red winter wheat.....	40 00
For the second best 2 bushels red winter wheat	20 00
For the best 2 bushels spring wheat.....	20 00
For the second best 2 bushels spring wheat....	10 00

Competitors for these prizes will be required to furnish samples of the wheat in the ear, and with the straw attached (say fifty ears of wheat and straw); also to furnish a written statement of the nature of the soil on which the wheat grew, method of cultivation, time of sowing, quantity of seed sown, manures (if any used), and mode and time of application; also the time of ripening and harvesting, and the yield per acre, with such other particulars as may be deemed of practical importance; also the name by which the variety is known in the locality where it was grown. The wheat must be one variety, pure, and unmixed. The prize to be awarded to the actual grower of the wheat, and the wheat which takes a prize to become the property of the society.

LOCOMOTIVES AND STEEP GRADIENTS.—The power possessed by locomotives to surmount steep gradients has been lately demonstrated in a very remarkable manner, by the opening of the Bhore Ghaut incline of the Great Indian Railway. The incline attains at one long lift the great hight of 1,832 feet, which is the highest elevation hitherto attained by any railway incline. It is fifteen and a half miles long, and the average gradient consequently is 1 in 46.39.

MANUFACTURE OF GLASS.—The first glass manufactory established in California recently commenced operations at San Francisco. About thirty men and boys are at present engaged in the works—bottles being the chief articles of manufacture. All the materials required, excepting soda ash, are obtained in the State.